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Socioeconomic and health-related inequalities in major depressive symptoms among older adults: a Wagstaff's decomposition analysis of data from the LASI baseline survey, 2017–2018

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ABSTRACT

Objectives To find out the association between socioeconomic and health status and depression among older adults and explore the contributing factors in the socioeconomic and health-related inequalities in late-life depression.

Design A cross-sectional study was conducted using large representative survey data.

Setting and participants Data for this study were derived from the baseline wave of the Longitudinal Ageing Study in India conducted during 2017–2018. The effective sample size was 30 888 older adults aged 60 years and above.

Primary and secondary outcome measures The outcome variable in this study was depression among older adults. Descriptive statistics along with bivariate analysis was conducted to report the preliminary results. Multivariable binary logistic regression analysis and Wagstaff's decomposition were used to fulfil the objectives of the study.

Results There was a significant difference for the prevalence of depression (4.3%; p<0.05) among older adults from poor (11.2%) and non-poor categories (6.8%). The value of the Concentration Index was −0.179 which also confirms that the major depression was more concentrated among poor older adults. About 38.4% of the socioeconomic and health-related inequality was explained by the wealth quintile for major depression among older adults. Moreover, about 26.6% of the inequality in major depression was explained by psychological distress. Self-rated health (SRH), difficulty in activities of daily living (ADL) and instrumental ADL (IADL) contributed 8.7%, 3.3% and 4.8% to the inequality, respectively. Additionally, region explained about 23.1% of inequality followed by life satisfaction (11.2) and working status (9.8%) for major depression among older adults.

Conclusions Findings revealed large socioeconomic and health-related inequalities in depression in older adults which were especially pronounced by poor household economy, widowhood, poor SRH, ADL and IADL difficulty, and psychological distress. In designing prevention programmes, detection and management of older adults with depression should be a high priority, especially for those who are more vulnerable.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The study uses a large nationally representative sample of the older population.
⇒ A comprehensive scale was used to measure the depression among older adults.
⇒ The cross-sectional design is a limitation of the study as it is impossible to establish the observed directions of the relationships.

BACKGROUND

The WHO estimates that the proportion of older adults would double from 12% to 22% and that low-income and middle-income countries will be home to 80% of all older adults by 2050.[1] Similarly in India, it is estimated that the population of older adults will double by the year 2050 and is expected to reach 19% of the total population.[2]

Increasing age reduces both physical and mental wellness. Studies have shown that older adults are highly prone to mental illness because of biological and socioeconomic factors.[2] Mental health conditions affect the quality of life,[3] and could also lead to morbidity and premature mortality.[4] One of the common mental disorders in late life is depression, which has devastating consequences and therefore becomes a serious public health concern.[5] Globally, around 322 million people suffer from depression.[6] In 2010, depression alone accounted for the second global disease burden and it was also projected to be the key cause of years lived with disability in 2020.[7] Numerous studies have been carried out to estimate the overall

prevalence rate for depressive disorders among older adults in various countries and cultural settings. Studies conducted among older adults in low-income and middle-income countries recorded lower prevalence for depression in China (2.6%), South Africa (6.4%), Ghana (11%) and Russia (15.6%), but in Mexico (23.7%) and India (27.4%) higher rates were recorded.[8] Similarly, a study among the older population in Iran also estimated a higher rate of depression at 43%.[9] A higher pooled prevalence rate among the older adults was also found in a recent meta-analysis and systematic review from different parts of South-Asian countries (42%)[10] and India 34.4%.[9]

Though the higher prevalence of depressive symptoms among older adults has been established, the issue of whether depressive symptoms are equal in people from various socioeconomic groups needs much attention. Research provides compelling evidence of a positive as well as reciprocal association between low socioeconomic status or poverty and poor mental health.[11 12] Studies conducted in low-income and middle-income countries have also validated that poverty and economic inequality are associated with depression among older adults.[13–16] The potential mechanisms of economic inequality in mental health can be the insufficient expenditure on healthcare among the poor and their inadequate access to healthcare services. Additionally, higher inequality can reduce social cohesion and capital, thus increasing stress. Further, social comparisons stemming from income inequality can cause various psychosocial and physiological issues.[17]

The role of education, occupation and income cannot be used interchangeably in understanding health.[18] Each one of these point to different phenomena and reflect different mechanisms underlying the social inequality in health. With regard to mental health, educational attainment reflects and relates to cognitive ability, self-efficacy, values that shape mental health related behaviour, coping strategy and the use of mental health services. Similarly, occupation can affect mental health in various ways. It can expose one to psychosocial stress due to lack of work, job strain, lack of balance between work-related effort and reward, low occupational social prestige, and so on.[19–21] Furthermore, the prevalence of depression is higher in women than in men. This high rate could be partly explained through health problems, poverty and widowhood among women.[22 23] Hence, educational status, gender/ethnic group, functional limitations, hearing difficulty, physical disability, perceived income inadequacy and living arrangement were significant correlates of depression and psychological distress among the young population[24–26] and older adults.[27–29]Studies in low-income and middle-income countries revealed that female older adults, those living in urban areas, those with lower educational attainment and lower household wealth, and those who have never worked in the past were found to have higher prevalence of depression.[8] The same study has also found that increasing education was found to be significant in lowering the odds of depression in India.

Furthermore, findings from a previous study has revealed that older women living without a spouse in a nuclear family and living alone were more strongly associated with depressive symptoms.[30] A Vietnamese study revealed that the distribution of depression (slight, moderate and major) varied among older adults according to the age group, alcohol use, physical activity, medicine intake, quality of life and some components of social connectedness.[31] Thus, due to increasing availability of cross-country data sets, previous evidence suggests that social inequality and health are bound to specific country contexts and the policy environment[32 33] and they can influence health through various channels.

Although depression is a major health problem among older adults, it is yet to be recognised as a public health issue.[9 34] Often, depression among older adults remains hidden and untreated, which ultimately leads to declined quality of life. Studies have firmly established that illnesses in the middle and later life are shaped by the development processes experienced in the different stages of life.[35–37] Furthermore, literature has also supported the fact that older people who have experienced differential socioeconomic status might experience large inequality in depression.[38] In addition, studies on the association between socioeconomic and health status and inequality are scarce.[13 23 39] Therefore, insights from studies oriented in this direction can help in developing intervention tools and determining the inter-relationships that can help plan better policies and service delivery mechanisms, thus improving the quality of life of older adults.[40] Figure 1 represents the theoretical framework for the study. In this study, we aim to bridge the gap in the literature with the objective of finding the association between socioeconomic and health status and depression among older adults and explore the contributing factors in the inequalities in late-life depression. Moreover, this study has also employed Wagstaff's decomposition analysis, a widely used method for studying income inequality determinants[17 41 42] for understanding late-life mental health inequality in India.

METHODS

Data

This study makes use of data from India's first nationally representative longitudinal ageing survey (Longitudinal Ageing Study in India (LASI), 2017–2018), which looks into the health, economic, and social determinants and repercussions of population ageing in the country.[43] Except for Sikkim, the sample includes 72 250 people aged 45 years and up, as well as their spouses, from all Indian states and union territories. To choose the final units of observation, the LASI uses a multistage stratified area probability cluster sampling design. The last unit of observation was households with at least one member aged 45 years or older. This survey offers empirical

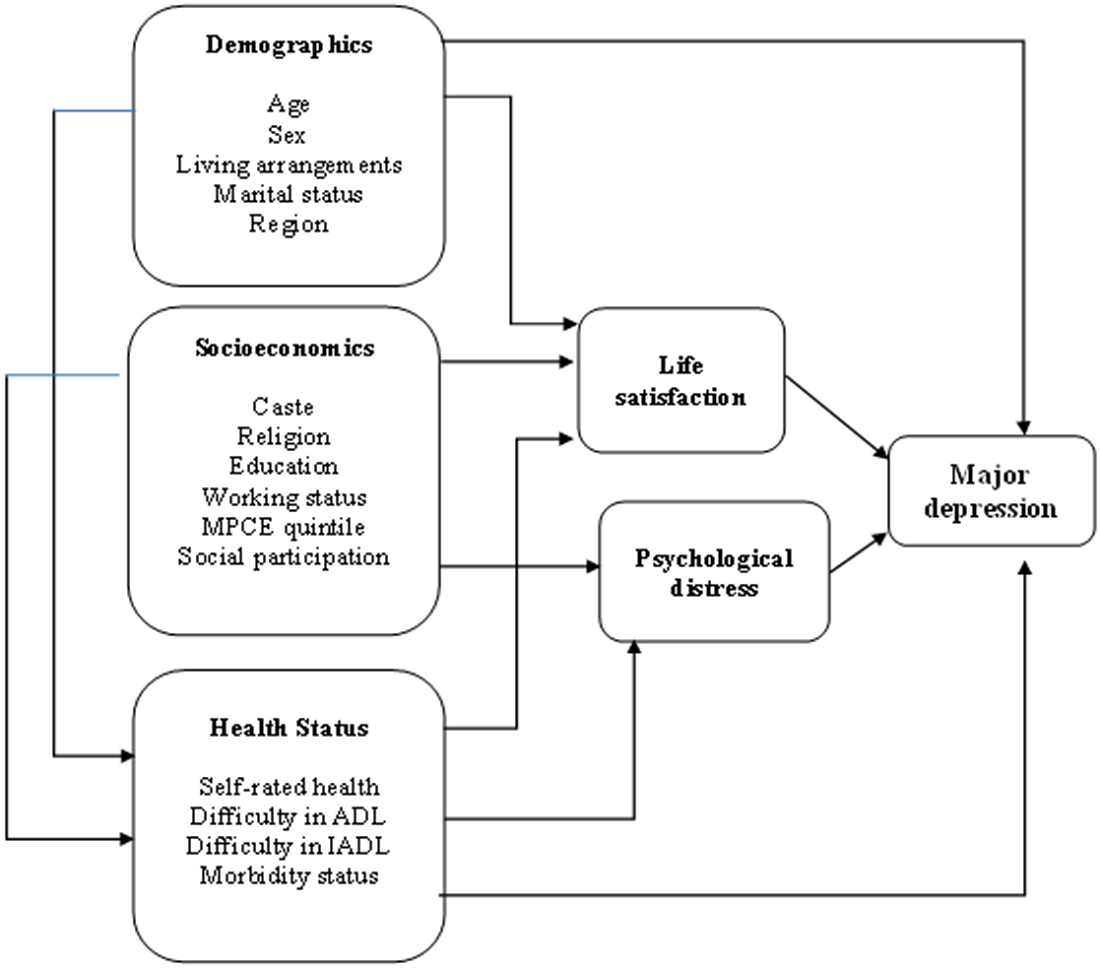

Figure 1 Theoretical framework. ADL, activities of daily living; IADL, instrumental ADL; MPCE: Monthly per-capita consumption expenditure.

evidence on demographics, household economic status, chronic health issues, symptom-based health conditions, functional and mental health, biomarkers, healthcare utilisation, work and employment, and more. It was created to analyse the impact of altering policies and behavioural outcomes in India, and it allows for cross-state and cross-national evaluations of ageing, health, economic status and social behaviours. The LASI Wave 1 report contains detailed information about the sampling frame. Older persons, aged 60 years and up, were simply included for the purpose of analysis. After removing 576 missing cases, the study's effective sample size was 30 888 older individuals.[43]

Variable description

Outcome variable

The outcome variable for the study was depression which was coded as 0 for 'not diagnosed with depression' and 1 for 'diagnosed with depression'.[43] Major depression among older adults with symptoms of dysphoria was calculated using the Composite International Diagnostic Interview - Short Form (CIDI-SF) on a scale of 0–10. This scale estimates a probable psychiatric diagnosis of major depression and has been validated in field settings and widely used in population-based health surveys.[44 45] It has 10 questions and respondents with positive answers to 3 or more symptoms are considered 'depressed'. The scale was validated for older adults.

The questions which were used to assess depression are as follow:

1. During the last 12 months, was there ever a time when you felt sad, blue or depressed for 2 weeks or more in a row?
2. Please think of the 2-week period during the last 12 months when these feelings were worst. During that time did the feelings of being sad, blue or depressed usually last all day long, most of the day, about half the day or less than half the day?
3. During those 2 weeks, did you feel this way every day, almost every day or less often than that?
4. Did you lose interest in most things?
5. Did you ever feel more tired out or low in energy than is usual for you?
6. Did you lose your appetite?
7. During the same 2-week period did you have a lot more trouble concentrating than usual?

8. People sometimes feel down on themselves, and no good or worthless. During that 2-week period, did you feel this way?
9. Did you think a lot about death—either your own, someone else's or death in general—during those 2 weeks?
10. Did you have more trouble falling asleep than you usually do during those 2 weeks?

Equity stratifier

Wealth Index was calculated using variables related to household assets, amenities and housing quality. For constructing the Wealth Index in LASI, we have used a similar approach that is being used in Demographic Health Surveys.[46] To construct the Wealth Index, we have used a set of 46 variables that cover the broad domains of the household's wealth and amenities and access to financial institutions. We have used principal component analysis to construct the composite Wealth Index. We observed that the first principal component with an eigenvalue of 7.2 has explained around 16% of the variance.[47] The factor scores of the variables were used as the weight in constructing the overall composite index. The five wealth quintiles were derived from the overall composite score; poorest, poorer, middle, richer and richest. These quintiles were based on the household's distribution, and population weight is adjusted for the household size in generating the composite Wealth Index. The reliability of the estimates has been carried out by α-test.[48 49] A value of α=0.82 indicates the reliability of the Wealth Index. Moreover, the Kaiser-Meyer-Olkin (KMO) test was used to measure sampling adequacy of the factor extracted. A KMO of >0.6 confirms sampling adequacy.[50] The description of the variables included in calculating the Wealth Index is as follows:

Housing quality: number of rooms, separate kitchen, the monetary value of the house.

Household amenity: water and toilet facilities in the household, availability of the electricity and cooking fuel.

Consumer durables: cars, scooters, motorcycles, bicycles, mopeds, refrigerators, computers, washing machines, laptops, stereo systems, cameras, camcorders, fans, coolers, air conditioners, mobile phones, musical instruments, jewellery, precious metals (gold, silver) and ornaments, antiques, valuable paintings, televisions, sewing machines, radios/transistors, water purifiers, juicer and mixtures, microwave oven.

Others: saving accounts, postal accounts, certificate of deposits or other depository products, stocks, mutual funds or shares in companies, and bonds.

Finally, the wealth quintile was categorised as *poor* which includes poorest and poorer category and *non-poor* which includes middle, richer and richest.

Explanatory variables

Individual factors

1. Age was categorised as young-old (60–69 years), old-old (70–79 years) and oldest-old (80+years).[51]
2. Sex was categorised as male and female.
3. Educational status was categorised as no education/primary not completed, primary, secondary and higher.
4. Living arrangement was categorised as living alone, living with spouse, living with children and living with others.
5. Marital status was coded as currently married, widowed and others. Others included respondents who separated/divorced/never married.[52]
6. Working status was categorised as currently working, ever worked but currently not working and not working. Ever worked and currently not working category also included the older adults who were retired.
7. Social participation was categorised as no and yes. Social participation was measured though the question 'Are you a member of any of the organisations, religious groups, clubs, or societies?'. The response was categorised as no and yes.[51]

Health indicators

1. Life satisfaction among older adults was assessed using the questions: (a) In most ways my life is close to ideal; (b) The conditions of my life are excellent; (c) I am satisfied with my life; (d) So far, I have got the important things I want in life; (e) If I could live my life again, I would change almost nothing. The responses were categorised as strongly disagree, somewhat disagree, slightly disagree, neither agree nor disagree, slightly agree, somewhat agree and strongly agree. Using the responses to the five statements regarding life satisfaction, a scale was constructed. The categories of the scale are 'low satisfaction' (score of 5–20), 'medium satisfaction' (score of 21–25) and 'high satisfaction' (score of 26–35) (Cronbach's α: 0.84).[43 53]
2. Self-rated health (SRH) was coded as good which includes excellent, very good and good whereas poor includes fair and poor.[28]
3. Difficulty in activities of daily living (ADL) was coded as no and yes. ADL is a term used to refer to normal daily self-care activities (such as movement in bed, changing position from sitting to standing, feeding, bathing, dressing, grooming, personal hygiene, etc). The ability or inability to perform ADLs is used to measure a person's functional status, especially in the case of people with disabilities and the older adults.[54]
4. Difficulty in IADL (instrumental ADL) was coded as no and yes. This refers to ADLs that are not necessarily related to fundamental functioning of a person, but allow an individual to live independently in a community. The set of questions asked were necessary for older adults' independent functioning in the community. Respondents were asked if they were having any difficulties that were expected to last more than 3 months,

Table 1 Socioeconomic profile of older adults in LASI, 2017–2018

Background characteristics	Poor		Non-poor	
	Sample	Percentage	Sample	Percentage
Individual factors				
Age				
Young-old	6833	58.5	11311	58.9
Old-old	3503	30.0	5762	30.0
Oldest-old	1345	11.5	2134	11.1
Sex				
Male	5415	46.4	9336	48.6
Female	6266	53.7	9871	51.4
Education				
No education/primary not completed	10021	85.8	10439	54.4
Primary completed	888	7.6	2725	14.2
Secondary completed	655	5.6	3751	19.5
Higher and above	118	1.0	2292	11.9
Living arrangements				
Alone	1186	10.2	440	2.3
With spouse	3049	26.1	2990	15.6
With children	6653	57.0	14835	77.2
Others	792	6.8	942	4.9
Marital status				
Currently married	7008	60.0	12207	63.6
Widowed	4383	37.5	6620	34.5
Others	291	2.5	379	2.0
Working status				
Working	4426	37.9	4957	25.8
Ever worked but currently not working	4927	42.2	8297	43.2
Not working	2328	19.9	5953	31.0
Social participation				
No	11308	96.8	18134	94.4
Yes	373	3.2	1073	5.6
Health indicators				
Life satisfaction*				
Low	4529	40.2	4827	25.9
Medium	2805	24.9	3775	20.3
High	3934	34.9	10006	53.8
Self-rated health*				
Good	5327	46.7	10489	55.7
Poor	6088	53.3	8353	44.3
Difficulty in ADL*				
No	8573	73.4	14991	78.1
Yes	3108	26.6	4216	22.0
Difficulty in IADL*				
No	5441	46.6	10712	55.8
Yes	6240	53.4	8495	44.2
Psychological distress				
Low	3567	30.5	8592	44.7
Medium	4047	34.7	5856	30.5
High	4067	34.8	4760	24.8
Morbidity status				
0	6694	57.3	7428	38.7
1	3154	27.0	6005	31.3
2+	1833	15.7	5774	30.1
Household/community related factors				
Religion				
Hindu	9752	83.5	15727	81.9
Muslim	1290	11.0	2041	10.6
Christian	340	2.9	555	2.9
Others	299	2.6	884	4.6
Caste				
Scheduled Caste	2996	25.7	2685	14.0
Scheduled Tribe	1529	13.1	834	4.3
Other backward Class	5011	42.9	8932	46.5
Others	2146	18.4	6756	35.2
Place of residence				
Rural	10748	92.0	10628	55.3
Urban	933	8.0	8579	44.7
Region				
North	862	7.4	3278	17.1
Central	3181	27.2	3113	16.2
East	3891	33.3	3212	16.7
North-East	366	3.1	569	3.0
West	1565	13.4	3927	20.4
South	1816	15.6	5108	26.6
Total	11681	100.0	19207	100.0

*Sample may be low due to missing cases.
ADL, activities of daily living; IADL, instrumental activities of daily living; LASI, Longitudinal Ageing Study in India.

such as preparing a hot meal, shopping for groceries, making a telephone call, taking medications, doing work around the house or garden, managing money (such as paying bills and keeping track of expenses), and getting around or finding an address in unfamiliar places.[54]

5. Psychological distress was coded as low, medium and high. Psychological distress was measured using the following questions: (a) How often did you have trouble concentrating? (b) How often did you feel depressed? (c) How often did you feel tired or low in energy? (d) How often were you afraid of something? (e) How often did you feel you were overall satisfied? (f) How often did you feel alone? (g) How often were you bothered by things that don't usually bother you? (h) How often did you feel that everything you did was an effort? (i) How often did you feel hopeful about the fu-

ture? (j) How often did you feel happy? The response was coded as: (1) Rarely or never; (2) Sometimes; (3) Often; and (4) Most or all of the times. The response was coded as per the question in binary form 0 'Rarely or never/ Sometimes' and 1 'Often/ Most or all of the time' (Cronbach's α: 0.70).[54] A score of 0–10 was thus calculated using the *egen* command in STATA and a variable consisting of three quintiles (low, medium and high) was made using the xtile command in STATA.

6. Morbidity status was categorised as 0 'no morbidity', 1 'any one morbid condition' and 2+ 'co-morbidity'.[55]

Household/community related factors

1. Religion was coded as Hindu, Muslim, Christian and Others.
2. Caste was recorded as Scheduled Tribe, Scheduled Caste, Other Backward Classes and others. The Scheduled Castes are a group of people who are socially separated and financially/economically disadvantaged as a result of their low caste status in the Hindu traditional hierarchy. The Scheduled Castes and Scheduled Tribes are among India's most economically disadvantaged groups. The Other Backward Classes refer to those who have been labelled 'educationally, economically, and socially backward'. In the traditional caste order, they are regarded as the lower castes but now most disadvantaged. The others group refers to mainly higher castes who are thought to have a greater social position.[56]
3. Place of residence was categorised as rural and urban.
4. The region was coded as North, Central, East, North-East, West and South.[51]

Statistical analysis

Bivariate analysis was conducted to identify the significant variables that are related to major depression. A two-sample proportion test[57] was used to evaluate if the prevalence of the various socioeconomic and demographic variables obtained according to the wealth status (Poor, Non-poor) were significantly different. In addition, multiple logistic regression was used to examine the association between major depression and various socioeconomic and demographic covariates. The presence of multicollinearity among the independent variables was detected using the variance inflation factor[58–60] at a cut-off point of 10. In the final model, to check the goodness of fit, an F-adjusted goodness-of-fit test was employed.[61 62] Due to complex sampling design effects in LASI, we accounted for inverse probability weights by using the *svyset* command in STATA V.15.[63]

Concentration curve (CC) and Concentration Index were used to determine the inequalities in the distribution of major depression by Wealth Index Scores. The CC depicts how a cumulative share of the major depression (y-axis) is accounted for by the cumulative percentage of the individuals ranked by Wealth Scores (x-axis).[39] If every individual has an identical health outcome, regardless of the wealth status, the CC would be a 45° line that runs from the lower-left corner to the upper-right corner, also known as the 'line of equality'. On the contrary, if the health outcome variable has higher values among poorer people, the CC will lie above the 'line of equality' and vice versa. The farther the curve is away from the baseline, represented by the equality line, the more unequal is the distribution of the health outcome variable.[64] The Concentration Index corresponds to twice the area between the CC and the line of equality.[65] In the present paper, the Concentration Index (CI) is computed as twice the covariance of the health outcome variable and a person's rank in terms of wealth status, divided by the mean of the health variable:[64]

$$CI = \frac{2}{\mu}\mathrm{cov}\left(\gamma_j, R_j\right), \quad (1)$$

where γ_j and R_j are the health status and fractional rank (in terms of the index of economic status) of the jth individual, respectively; μ is the mean of the health outcome variable and cov denotes the covariance.[66]

Decomposition of the Concentration Index

The present study used Wagstaff's Concentration Index decomposition approach to reveal the contribution of each explanatory variable to the measured health inequality (ie, major depression inequality).[67] According to Wagstaff, a linear regression model links health outcome variable (y) to a set of k explanatory variables (x_k):

$$y_i = \alpha + \sum_k \beta_k x_{ki} + \varepsilon_i, \quad (2)$$

where x_{ki} is a set of k explanatory variables for the ith individual, β_k signifies the coefficient and ε_i is an error term. Given the association of y_i and x_{ki}, in equation (2), the Concentration Index for y, can be written as follows:

$$C = \sum_k \left(\frac{\beta_k \bar{x}_k}{\mu}\right) C_k + \frac{GC_\varepsilon}{\mu}, \quad (3)$$

where C denotes the overall Concentration Index, μ is the mean of y, $\bar{x}_k$ is the mean of x_k, C_k is the normalised Concentration Index for x_k (defined exactly like Concentration Index), $\frac{\beta_k \bar{x}_k}{\mu}$ is the elasticity of health variable with the explanatory variables and GC_ε is the generalised Concentration Index for ε_i (residual component). Equation (3) suggests that the Concentration Index consists of explained and residual (unexplained) components.[39] In most cases, health outcome variables are rarely continuous. We have approximated decomposition analysis by using marginal effects on the logit model. A linear approximation of the non-linear estimation can be represented as:

$$y_i = \alpha^m + \sum_k \beta_k^m x_{ki} + \mu_i, \quad (4)$$

where β_k^m is the marginal effects $\left(\frac{dy}{dx}\right)$ of each x and μ_i signifies the error term generated by the linear approximation. The Concentration Index (CI) for the heath variable (y) (in our case, major depression) is given as:

Table 2 Percentage of older adults suffering from major depression by their background characteristics

Background characteristics	Poor %	Non-poor %	Differences %	P value
Individual factors				
Age				
Young-old	11.0	6.5	4.5	0.001
Old-old	10.5	6.8	3.7	0.001
Oldest-old	13.8	8.5	5.3	0.001
Sex				
Male	9.7	6.0	3.7	0.001
Female	12.5	7.6	4.8	0.001
Education				
No education/primary not completed	11.3	7.5	3.7	0.001
Primary completed	10.8	7.0	3.8	0.001
Secondary completed	11.1	5.2	5.9	0.001
Higher and above	6.0	6.0	0.0	0.483
Living arrangements				
Alone	14.5	10.0	4.5	0.205
With spouse	9.9	6.7	3.2	0.001
With children	10.8	6.7	4.2	0.001
Others	14.5	8.5	5.9	0.001
Marital status				
Currently married	10.3	5.9	4.4	0.001
Widowed	12.8	8.6	4.1	0.001
Others	8.7	5.5	3.3	0.001
Working status				
Working	9.9	5.4	4.5	0.001
Ever worked but currently not working	13.1	7.7	5.4	0.001
Not working	9.6	6.7	2.8	0.772
Social participation				
No	11.2	7.0	4.2	0.001
Yes	10.9	4.5	6.4	0.198
Health indicators				
Life satisfaction				
Low	15.5	10.4	5.1	0.001
Medium	8.6	7.1	1.5	0.082
High	7.9	5.1	2.9	0.001
Self-rated health				
Good	6.5	3.6	2.9	0.001
Poor	15.3	10.9	4.4	0.001
Difficulty in ADL				
No	8.7	5.3	3.4	0.001
Yes	18.3	12.5	5.8	0.001
Difficulty in IADL				
No	8.1	4.0	4.1	0.001
Yes	14.0	10.5	3.4	0.001
Psychological distress				
Low	5.3	3.0	2.3	0.001
Medium	6.8	5.3	1.5	0.001
High	20.3	15.4	4.9	0.001
Morbidity status				
0	9.3	4.6	4.6	0.001
1	11.4	6.8	4.6	0.001
2+	17.8	9.7	8.1	0.001
Household/community related factors				
Religion				
Hindu	11.0	6.9	4.1	0.001
Muslim	12.7	7.3	5.4	0.001
Christian	9.9	4.5	5.4	0.572
Others	12.7	6.7	5.9	0.016
Caste				
Scheduled Caste	11.6	7.7	4.0	0.000
Scheduled Tribe	5.1	4.5	0.6	0.016
Other backward Class	12.4	7.2	5.2	0.001
Others	11.9	6.3	5.6	0.001
Place of residence				
Rural	11.1	7.7	3.4	0.001
Urban	12.4	5.7	6.7	0.001
Region				
North	6.9	6.9	0.0	0.718
Central	16.6	12.0	4.6	0.020
East	9.4	6.4	3.0	0.001
North-East	7.4	4.1	3.3	0.044
West	11.8	5.7	6.2	0.001
South	7.8	5.1	2.7	0.016
Total	11.2	6.8	4.3	0.001

P value based on proportion test.
ADL, activities of daily living; Differences, Poor – Non-poor; IADL, instrumental activities of daily living.

$$CI = \sum_k \left(\frac{\beta_k \bar{x}_k}{\mu} \right) C_k + GC_\varepsilon / \mu. \quad (5)$$

Patient and public involvement

No patient was involved.

RESULTS

Table 1 represents the socioeconomic profile of older adults in India. About 85.8% and 54.4% of older adults were not educated in the poor and non-poor categories, respectively. Nearly, 10.2% and 2.3% of older adults were living alone in the poor and non-poor categories, respectively. Almost 37.9% and 25.8% of older adults were working in the poor and non-poor categories, respectively. Almost 3.2% and 5.6% of older adults socially participated in the poor and non-poor categories, respectively.

Table 3 Logistic regression estimates for major depression among older adults

Background characteristics	AOR 95% CI
Individual factors	
Age	
Young-old	Ref.
Old-old	0.79*(0.7 to 0.88)
Oldest-old	0.71*(0.6 to 0.83)
Sex	
Male	Ref.
Female	1.07 (0.95 to 1.21)
Education	
No education/primary not completed	0.76*(0.61 to 0.96)
Primary completed	0.88 (0.69 to 1.12)
Secondary completed	0.84 (0.67 to 1.07)
Higher and above	Ref.
Living arrangements	
Alone	0.91 (0.71 to 1.18)
With spouse	0.81 (0.63 to 1.03)
With children	0.82*(0.67 to 0.99)
Others	Ref.
Marital status	
Currently married	Ref.
Widowed	1.24*(1.09 to 1.4)
Others	0.85 (0.61 to 1.18)
Working status	
Working	Ref.
Ever worked but currently not working	0.96 (0.85 to 1.08)
Not working	0.79*(0.68 to 0.92)
Social participation	
No	Ref.
Yes	0.87 (0.7 to 1.08)
Health indicators	
Life satisfaction	
Low	1.62*(1.45 to 1.82)
Medium	1.11 (0.98 to 1.26)
High	Ref.
Self-rated health	
Good	Ref.
Poor	1.96*(1.76 to 2.18)
Difficulty in ADL	
No	Ref.
Yes	1.51*(1.35 to 1.68)
Difficulty in IADL	
No	Ref.
Yes	1.47*(1.31 to 1.64)
Psychological distress	
Low	Ref.
Medium	1.29*(1.12 to 1.48)
High	3.23*(2.84 to 3.68)
Morbidity status	
0	
1	1.24*(1.1 to 1.39)
2+	1.59*(1.41 to 1.8)
Household/community related factors	
Wealth quintile	
Poorest	1.39*(1.15 to 1.68)
Poorer	1.25*(1.04 to 1.5)
Middle	1.19*(1 to 1.41)
Richer	1.19*(1.01 to 1.4)
Richest	Ref.
Religion	
Hindu	Ref.
Muslim	1.09 (0.94 to 1.27)
Christian	1.01 (0.8 to 1.28)
Others	1.36*(1.09 to 1.7)
Caste	
Scheduled Caste	1.02 (0.88 to 1.18)
Scheduled Tribe	0.57*(0.46 to 0.69)
Other backward Class	1.16*(1.03 to 1.31)
Others	Ref.
Place of residence	
Rural	1.18*(1.05 to 1.33)
Urban	Ref.
Region	
North	Ref.
Central	1.8*(1.53 to 2.11)
East	0.86 (0.73 to 1.01)
North-East	0.67*(0.52 to 0.85)
West	1.28*(1.08 to 1.53)
South	0.6*(0.51 to 0.71)

*If p<0.05.
ADL, activities of daily living; AOR, adjusted OR; IADL, instrumental activities of daily living; Ref, references.

A higher proportion of older adults from the poor category reported low life satisfaction (poor: 40.2% and non-poor: 25.9%). Similarly, a higher proportion of older adults who were from the poor category had poor SRH (53.3%) in reference to older adults from the non-poor category (44.3%). A higher proportion of older adults had difficulty in ADL (poor: 26.6% vs non-poor: 22.0%) and IADL (poor: 53.4% vs non-poor: 44.2%) were from the poor category. A higher proportion of older adults from the poor category had high psychological distress (34.8%) compared with older adults from the non-poor

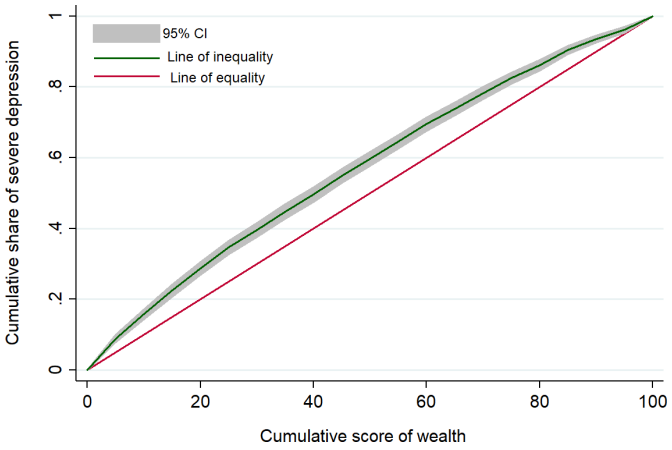

Figure 2 Concentration curve for major depression among older adults in India, 2017–2018.

category (24.8%). A higher proportion of older adults from the non-poor category (30.1%) had more than two morbidity conditions in comparison to older adults from the poor category (15.7%).

Table 2 represents the percentage of older adults suffering from major depression by their background characteristics in India. It was found that the prevalence of major depression was higher among older adults from the poor category (11.2%) than the non-poor category (6.8%). The difference in prevalence was also statistically significant (4.3%; p<0.05).

Table 3 reveals logistic regression estimates for major depression among older adults by their background characteristics in India. The estimates presented are adjusted estimates in the table. It was found that wealth quintile was significantly associated with major depression among older adults. That is, older adults from the poorest wealth quintile had 39% significantly higher likelihood of suffering from major depression than older adults from the richest wealth quintile [adjusted OR: 1.39; CI 1.15 to 1.68]. Additionally, age, education, living arrangement, marital status and working status were the significant predictors of major depression. Moreover, life satisfaction, SRH, difficulty in ADL and IADL, psychological distress and morbidity status were also significantly associated with major depression among older adults.

Figure 2 reveals that major depression was concentrated among older adults from the socioeconomically poor strata. The value of the concentration quintile was −0.179 which also confirms that the major depression was more concentrated among poor older adults.

Table 4 represents the decomposition estimates for major depression among older adults in India. It was found that about 38.4% of the socioeconomic and health-related inequality was explained by the wealth quintile for major severe depression among older adults. Moreover, about 26.6% of the inequality in major depression was explained by psychological distress. Additionally, region explained about 23.1% of inequality followed by life satisfaction (11.2%) and working status (9.8%) for major depression among older adults. SRH, difficulty in ADL

Table 4 Decomposition estimates for major depression among older adults

Background characteristics	Elasticity	CCI	Absolute contribution	Percentage contribution
Individual factors				
Age				
Young-old				−0.2
Old-old	−0.005	−0.006	0.000	−0.2
Oldest-old	−0.001	0.005	0.000	0.0
Sex				
Male				0.9
Female	0.012	−0.011	0.000	0.9
Education				
No education/primary not completed				−11.0
Primary completed	0.002	0.160	0.000	−1.9
Secondary completed	0.002	0.369	0.001	−3.8
Higher and above	0.001	0.601	0.001	−5.3
Living arrangements				
Alone				3.4
With spouse	−0.002	−0.166	0.000	−2.0
With children	−0.008	0.098	−0.001	5.2
Others	0.000	−0.091	0.000	0.2
Marital status				
Currently married				0.1
Widowed	0.003	−0.022	0.000	0.4
Others	−0.001	−0.072	0.000	−0.3
Working status				
Working				9.8
Ever worked but currently not working	−0.002	0.010	0.000	0.1
Not working	−0.009	0.158	−0.001	9.7
Social participation				
No				0.1
Yes	0.000	0.171	0.000	0.1
Health indicators				
Life satisfaction				
Low				11.2
Medium	−0.009	−0.057	0.001	−3.7
High	−0.016	0.137	−0.002	14.9
Self-rated health				
Good				8.7
Poor	0.022	−0.059	−0.001	8.7
Difficulty in ADL				
No				3.3
Yes	0.010	−0.051	0.000	3.3
Difficulty in IADL				
No				4.8
Yes	0.014	−0.052	−0.001	4.8
Psychological distress				

Continued

Table 4 Continued

Background characteristics	Elasticity	CCI	Absolute contribution	Percentage contribution
Low				26.6
Medium	0.003	−0.038	0.000	0.7
High	0.030	−0.125	−0.004	25.8
Morbidity status				
0				−14.8
1	0.004	0.039	0.000	−1.1
2+	0.010	0.209	0.002	−13.7
Household/community related factors				
Wealth quintile				
Poorest				38.4
Poorer	−0.003	−0.282	0.001	−5.0
Middle	−0.003	0.084	0.000	1.8
Richer	−0.003	0.441	−0.001	9.0
Richest	−0.006	0.796	−0.005	32.6
Religion				
Hindu				−1.1
Muslim	0.000	0.012	0.000	0.0
Christian	0.001	0.010	0.000	0.0
Others	0.001	0.211	0.000	−1.0
Caste				
Scheduled Caste				−8.9
Scheduled Tribe	−0.003	−0.351	0.001	−7.7
Other backward Class	0.007	0.019	0.000	−0.9
Others	0.000	0.213	0.000	−0.3
Place of residence				
Rural				5.6
Urban	−0.002	0.452	−0.001	5.6
Region				
North				23.1
Central	0.013	−0.187	−0.002	16.5
East	−0.002	−0.215	0.000	−3.4
North-East	0.000	−0.013	0.000	0.0
West	0.001	0.097	0.000	−0.9
South	−0.009	0.175	−0.002	10.8
Calculated CCI			−0.015	100.0
Total CCI			−0.179	
Residual			−0.164	

ADL, activities of daily living; CCI, concentration index; IADL, instrumental activities of daily living.

and IADL explained 8.7%, 3.3% and 4.8%, respectively, and place of residence explained 5.6% of the observed inequalities in major depression among older adults.

DISCUSSION

The current study was an attempt to understand the socioeconomic and health-related inequalities in major depression among the older population in India, using nationally representative data. The overall prevalence was comparable and in parallel with other studies which showed that the prevalence of depression ranged from 17% to 34.4%.[8 9 68] On the other hand, the study found greater inequality with 11.2% of the poor older adults suffering from major depression in comparison to nearly 7% of non-poor older adults. A substantial contribution of household wealth status (with a more than 38%) to the inequality in prevalence of depressive symptoms among older individuals was observed in the present study.

The study validates that age, education, living arrangement, marital status and working status were significantly associated with major depression in the older population. Previous studies have examined the association between age and depression and the results have been mixed. Some studies found that the likelihood of developing depression increases with age[69] and in case of older adults living alone in particular,[70] while several other studies had contradicting results,[44 71 72] suggesting that with increasing age, individuals tend to have higher adaptation towards stressful events. The present study found that the chances of suffering from major depression decreases with age confirming the later studies. Depressive disorders were found to be higher in women than in men.[16 23 73 74] Similarly, bivariate estimates of this study found that the prevalence of depression in older women was higher compared with men. The possible explanation for this could be that older women were exposed to various health problems and adverse life events including widowhood and limited resource availability.[75]

Our study findings are contrary to the evidence regarding the role of lack of education as a major factor associated with depression. There is high level of inequality in the distribution of depression with significantly increased rates of depression among higher educational groups. Previous research investigated inequalities in depression by gender, educational attainment and wealth in isolation. On the other hand, with regard to the household economic status, our findings are consistent with previous studies in India and other developing countries showing a greater prevalence of depression in the population and in older adults in particular from the economically poor background.[8 76 77] Therefore, in developing countries like India, the benefits of depression treatment in primary-care units may more than offset its associated costs among older individuals from poor households in particular.

Another major finding of the study was the lower level of life satisfaction that was positively associated with major depression which is in parallel to previous findings that reported a significant inverse association of life satisfaction with mental distress and depressive symptoms.[78 79] Importantly, the psychological distress that was assessed using the Center for Epidemiological Studies Depression (CESD-10) scale was positively associated with major depression (measured using the CIDI-SF scale) in our study. This is in line with previous studies showing that multiple domains of depressive symptoms are directly

associated with endorsement of clinical depressive disorder.[80] Furthermore, significant links have been found between functional disability in ADL and IADL and depression among older adults. Various studies[17 52–54] have shown that depressive symptoms were found among older adults with functional limitations.[14 27] A higher depressive rate among older adults with functional disability or limitation could be attributed to reduced physical activity and social interactions.[81 82] Nonetheless, the association of social participation with depression showed no significance in our study. Furthermore, a positive and significant association between presence of higher number of morbidities and depressive symptoms was also found in our study. The finding is consistent with previous studies suggesting that the older population is more likely to suffer from multiple chronic diseases, which is also associated with escalating mental distress and depressive disorders.[83]

Findings from the Western countries indicate that strong welfare states may prevent or lower the depressive symptoms by providing a social strata with better healthcare and social service.[32] Similarly, studies in developing countries show that the state provisions like welfare schemes and old age pensions can offset the socioeconomic consequences of poor health by reducing the cost of healthcare and improving quality of life, associated with increased healthy life expectancy.[84–86] Unlike the well-established healthcare systems and policies in the Western countries for older adults, dedicated geriatric care is a distant dream in India because of the lack of a trained workforce, absence of infrastructure[87] and poor implementation of polices. However, it is also worth mentioning that despite the existence of various schemes, the awareness and utilisation of these schemes vary from region to region.[88 89] Hence, a proper understanding of the morbidity pattern among the older adults and their underlying inequalities is essential to strengthen the geriatric healthcare services to meet the needs of older people.

Our study has certain limitations. First, we classified people as having probable depression on the basis of the CIDI-SF depression screening tool. Thus, the estimates reported in the study are not based on clinical appraisal and should be interpreted with caution. Also, the cross-sectional design of the study does not allow any causal inferences in the observed associations and suggests the possibility of reverse or bidirectional causality in many of the findings. The strength of this study is that it is based on one of the largest, nationally representative data of older adults' mental health in a resource-poor setting in the developing world. We measured depression using an internationally validated scale of CIDI-SF.

Conclusion

The findings revealed large socioeconomic and health-related inequalities in depression in older adults which were especially pronounced by poor household economy, widowhood, poor SRH, difficulty in ADL and IADL, and psychological distress. Identifying these vulnerable groups can be the starting point for designing and evaluating social, economic and mental health-related interventions to reduce the avoidable inequalities in depression. Further, in order to reduce the burden of older adults' mental health problems in India, it is vital to strengthen interventions that address determinants such as socioeconomic position, health status and structural supports. The findings also highlight that in designing prevention programmes, detection and management of older adults with depression should be a high priority, especially for those who are more vulnerable.

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Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval The data are freely available in the public domain and survey agencies that conducted the field survey for the data collection have collected prior informed consent from the respondents. The Indian Council of Medical Research (ICMR) and all partner institutions extended the necessary guidance and ethical approval for conducting the LASI.

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Data availability statement Data may be obtained from a third party and are not publicly available. The study uses a secondary source of data that is freely available in the public domain through a request from https://iipsindia.ac.in/sites/default/files/LASI_DataRequestForm_0.pdf.

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